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ABSTRACT

There is a need for basic readability research and for an easily applied and accurate new readability formula. Two steps taken toward the development of such a formula are the revision of a vocabulary list for primary grades and the combination of reading exercises given at different grade levels into a single scale of ascending difficulty. Much recent readability research seems to rework old topics while ignoring current areas of needed research. In 1852, Herbert Spencer anticipated readability discussions in an article that emphasized economizing the reader's attention, anticipated syntactic and semantic readability features, and suggested four variables now considered in devising readability formulas: syllable length, word familiarity, word abstractness, and sentence length. Recent developments have facilitated the use of these variables in readability. Future research should be devoted to the relationship of readability to cognitive and affective variables, orthographics, graphics design, and developmental reading. The development of vocabulary skills should be considered in conjunction with the development of skills involving decoding, syntactic patterns, and inferencing; and lists should be developed that show the developmental sequence of these skills in major reading series. Research has been conducted that can serve as the basis for such work. (GW)

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A Framework for Readability Research

Status of our Research

Since the presentation in 1973 and the publication in 1975 of the Harris-Jacobson Readability formulas, we have been developing two separate lines of research related to readability. The first of these is based on statewide testing of a stratified random sample consisting of 22,650 students in 60 school districts in Virginia who completed 190 McCall-Crabbs Standard Test Lessons in Reading. Data were also collected for each student which contained their aptitude and achievement scores on standardized tests and demographic variables. From this sample of over 22,000, a subsample of approximately 12,000 pupils was selected to provide a multivariate normal distribution that is representative of the characteristics of a nationwide sample on aptitude tests and reading comprehension tests.

On the McCall-Crabbs tests the criterion variable for predicting reading difficulty was the average percentage of correct responses on the 190 passages. In addition to comprehension questions, the pupils were asked to rate each selection for interest, difficulty of the passage, and difficulty of the questions. Computerized readability formulas based on these data were presented in the Journal of Reading, October 1976. Those were multi-variable formulas requiring use of a computer.

The second line of work was a revision of the Harris-Jacobson Core Vocabulary. The latest series published by six major publishers of basal readers were placed word for word on computer tapes. A preliminary analysis of the primary reader vocabularies shows that many words are now used in readers at lower grade levels than in the readers of ten years ago. We had

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intended to use this revised word list as the basis for new readability formulas. However, the magnitude of the change confronted us with a dilemma; if we use our 1972 list, the current reading series all rate as too difficult for their grade levels. If we use the current vocabulary, the previous series all seem too easy, which we think is contrary to fact.

We are now returning to the McCall-Crabbs exercises, and hope to discover which of the two vocabularies gives the best predictions. Since we have a large representative sample from grades 2 through 12, this should provide an anchor for new readability formulas.

Concerns with Readability

After years of research on readability, the authors have seen public opinion swing from little or no concern with readability to the urgent concern of today when the improvement of text attracts even presidential attention and comment. It also attracts warnings that there may be an undue emphasis on readability (Nelson, 1978, Standahl, 1978), though readability has been in a state of benign neglect for decades.

Our concerns are somewhat different. We have become very much concerned with the expanded activity in readability research since it does not seem to have a basis for setting priorities or an organizing principle to determine the relevant lines of inquiry to pursue. Some of this work seems to rework topics which were deemed important more than one hundred years ago while ignoring current areas of needed research. In the remaining sections of this paper we will place readability in historical perspective, suggest an organizing principle for research priorities and apply this principle to identify future research needs.

Historical Evolution of Readability

In 1841, Thomas Carlyle observed that to invent printing is to make democracy inevitable. His observation implied that a shift from an aristocratic to a democratic society would result from mass publication. However, mass publication requires mass literacy to insure that messages are not only communicated but are received and understood. Thus printed messages must be readable to accomplish the inevitable change predicted by Carlyle.

Hirsch (1977) argues that there is a general evolution toward better readability due to the universal tendency of languages to increase in communicative efficiency and due to prose also exhibiting this evolutionary tendency. After analyzing the work of Jespersen, Zipf, Martinet, Venezky and others, he argues convincingly that this tendency is irreversible, and shows how historical progress was attained by the development of prose conventions such as: the reduction in the scope for choice of word order, the establishment of normalized spelling and punctuation, and the development of uniformity and clarity of printed letters. He shows that historical progress was achieved by the development of prose conventions which set up even more normalized patterns of expectation.

Early Readability Discussions by Herbert Spencer

An early discussion of readability was provided in 1852 by Herbert Spencer when he published an article on prose in the Westminster Review entitled "The Philosophy of Style." Though this essay was written more than a century ago, it is considered by Gunning (1968) and by Hirsch (1977) as the best and most convincing introduction to the subject of readability.

Spencer explained that a reader brings limited mental power to the task of comprehending writing. He uses it in three ways: (1) in understanding the words used, (2) in getting their relationship, and (3) in realizing the thought conveyed. Spencer, without using the word readability, used its meaning which he expressed in the phrases "economy of the reader's attention" and "least possible mental effort." Spencer also uncovered a dilemma when he used the single word "economy" to mean both efficiency of effort to improve understanding, and variety of presentation (stylistic variety) to achieve interest and delight. This dilemma arises from the different requirements for conveying the cognitive and affective impact of the message. The cognitive component benefits from the economy and efficiency of short concrete words, short sentences, and simple style, while the affective component benefits from stylistic variety which affects the reader's interest and mood.

Behind Spencer's empnasis on economizing the reader's attention was his correct intuition that the time and effort devoted to the decoding reading would be subtracted from the energy left to consider the meaning. He also suggested the importance of images; and in the second part of his essay he analyzed the contribution of figurative language to the affective component of the message. In Spencer's time graphic design was at a primitive stage of development, and the graphic message was presented through prose. Today graphic design plays a much greater role in conveying messages and yet its impact on the comprehensibility of messages has not been studied.

The reasons for Gunning and Hirsch to consider Spencer the best source for an introduction to readability is that he anticipated syntactic and semantic features of readability and suggested four variables which are now included in readability formulas. These variables are: syllable length of words, familiarity of words, abstract levels of words, and sentence length. These contributions are discussed below.

Syntactic function

Spencer anticipated the syntactic dimension of readability when he wrote:

> The longer the time that elapses between the mention of any qualifying member and the member qualified, the longer must the mind be exerted in carrying forward the qualifying member for use.

Research to measure this syntactic dimension in readability has been attempted by Bormuth (1966, 1968), Coleman (1968), Jacobson and MacDougall (1969), and Selden (1977). Linguistic and psycholinguistic explanations of this phenomena have been provided in the works of Chomsky, Fillmore and others.

Sentence length and syllable length

Spencer also observed that "if it can be an advantage to express an idea in the smallest number of words, then it must be an advantage to express it in the smallest number of syllables!" Both concepts of "smallest number of words" and "smallest number of syllables" have been incorporated into many readability formulas as sentence difficulty (words per sentence) and as word difficulty (syllables per word or number of uncommon words).

Semantic function

Spencer considered "stupendous" more powerful than "vast," because

it "allows the reader's consciousness more time to dwell on the quality predicated." Thus he recognized that even though a shorter word spares the reader both effort and time, a shorter word cannot always serve the same semantic function.

Abstract words

Spencer also anticipated another variable of readability equations in stating, "The economy of the recipient's mental energy... may equally be traced to the superiority of specific over generic words. That concrete terms produce more vivid expressions than abstract ones..." The concept that abstract and concrete words relate to the difficulty of materials was incorporated into readability equations by Flesch (1950).

Familiar words and short words

Spencer sought reasons for the preference of Saxon to Latin words in English and attributed this to their greater familiarity through their greater use, and the fact that they are shorter. Both points have been incorporated into readability formulas; shorter words are determined by syllable or letter counts, and counts of familiar words are determined by counting words not contained in lists of familiar words.

Developments Which Facilitate Using Spencer's Variables In Readability

List of familiar words

Though Spencer identified unfamiliar words as a factor which contributed

to the reading difficulty of a passage, there were no objective ways to distinguish familiar from unfamiliar words until Edward L. Thorndike's pioneering Teachers Word Book was published in 1921. This was a list of the 10,000 words occurring most frequently in a word count of 41 sources, including children's literature, elementary school textbooks, practical manuals, newspapers, the Bible, English classics, and adult correspondence -- about 4,500,000 running words in all. Ten years later, Thorndike (1931) expanded his list to 20,000 words by making additional word counts from 200 sources and by taking some words from five other word lists. This list was further expanded to 30,000 by Thorndike and Lorge (1944). Thorndike's lists tell how common or familiar a word is in representative English printed material.

In applications to readability, the Thorndike lists were used in formulas by Vogel and Washburne (1928), Washburne and Morphett (1938), Yoakam (1955) and Jacobson (1965). Two word lists by Edgar Dale (1931, 1948) were used in formulas by Gray and Leary (1935), Lorge (1944), Dale and Chall (1948) and Spache (1953). A list by Harris-Jacobson, Basic Elementary Reading Vocabularies (1972), was a major source for the revision of the Spache formula (1974) and for the Harris-Jacobson formulas (1973, 1974, 1975, 1976).

It is evident that the development of these word lists clarified the determination of familiar and unfamiliar words and facilitated the inclusion of familiar words in readability formulas.

Sentence length and word length

Relating sentence length to reading difficulty dates back to first efforts to quantify variables into formulas by Dale and Tyler (1934) and Gray and Leary (1935). Sentence length is measured by counting the number of letters, number of syllables or the number of words in each sentence in sample passages. As sentences begin and end in a characteristic way, sentence length can easily be determined in a mechanical fashion by manual counts or by computer. As manual counts are facilitated by counting words and computerized counts by counting either words or letters, most readability formulas use word counts to determine sentence length.

In readability formulas, word length is determined by counting the number of letters or the number of syllables in each word in a sample passage. Counting the number of letters in each word is easy for a computer and easy, though tedious, for a person. Syllable counts are slightly more complex than letter counts. Computer counts of the number of syllables in a word must be based on estimates while manual counts are relatively straight forward once certain ambiguous ways of breaking words into syllables have been resolved by the person doing the counting. Computers can estimate the number of syllables by counting the number of letters and dividing by 3.1127 (since most syllables are about 3 letters long) or by counting the number of vowels in each word and dividing by 1.1761 (since most syllables have one vowel). These estimating procedures give correlations of .98 and .96, respectively, with the number of syllables in a word (Felsenthal,

et al, 1971). Thus word length seems to be adequately measured by counting letters, by counting syllables or by estimating syllable counts.

In most readability formulas, identifying a word and determining the number of words are relatively uncomplicated procedures except for infrequent special cases as in: compound names such as "St. John, Del Rio" or initials such as "John F.S. St. John" (Dale, Chall, 1948); or in mathematical or symbolic equations such as "$2H_2 + O_2 = 2H_2O$" (Jacobson, 1965). In readability formulas identifying sentences and counting the number of sentences in a passage are routinely done except for isolated exceptional cases. One exception arises from the repetition of a single word as in "oh, oh, oh; look, look, look; etc." (Spache, 1953) which may be encountered in beginning readers. Another arises when determining the number of sentences in a passage which contains quotations or quotes within quotations. However, the exceptions to word and sentence identification are relatively rare, and word length and sentence length factors of reading difficulty are esentially used as Spencer defined them in 1852.

Abstract words

Ojemann (1934) was one of the first investigators to demonstrate that in magazine passages graded for difficulty according to the tested comprehension of readers, the difficult passages contained more abstractions and more abstract relationships than the easy passages which were more concrete. Morris and Holversen (Chall, 1958) developed four classifications of content words (as distinct from non-content or structural words, such as prepositions,

conjunctions, articles, etc.) which enabled words to be ranked from simple (category I) to abstract (category IV), and an application of these categorical rankings to 120 McCall-Crabbs Standard Test Lessons in Reading gave correlations comparable to those determined by two established readability formulas containing more factors. Flesch (1943) related the level of difficulty measured by counts of abstract words to counts of prefixes, suffixes and inflectional endings (affixed morphemes) and incorporated these into his formula for determining reading-ease. In revisions of his formula, Flesch changed from counting affixes to counting syllables which reduced the effort required to use the formula but also reduced its validity as a measure of abstract words. Thus, abstract words have been recognized as a factor of reading difficulty since Spencer first observed this relationship, but readability formulas do not include measures of abstract words because they can not be objectively and reliably determined.

Recent applications of complete computerized analyses of textbooks in content areas has produced some work which might be perceived as measuring abstract words in readability. This work adjusts readability scores to account for abstract words which must be learned to understand a content area and which should not be treated in the same way as other difficult words in readability calculations. This adjustment is made for material which has a definable list of essential technical (abstract) words that have been reinforced a sufficient number of times. After adjustment, this material is rated less difficult to read than material which haphazardly

introduces technical concepts without regard for the variety of terms or for the number of reinforcements needed for mastery of the concepts. Such an adjustment of readability scores has merit in that it aligns readability with good instructional practice where the more important concepts recieve greater emphasis and reinforcement. It also has merit in that it provides refined objective procedures for determining abstract words in content areas (Jacobson, 1976).

Research Needs

Fifty years after Thorndike's pioneering contributions one can summarize the widely used readability formulas as still utilizing word familiarity, word length, and sentence length, all of which were identified as difficulty factors by Herbert Spencer in 1852. It seems that an organizing principle is needed to define future research needs so as not to recycle the same work for the next fifty years.

Organizing principle for research

The dilemma which Spencer encountered when he tried to incorporate two desired but conflicting characteristics of good writing (efficiency of the presentation of words and stylistic variety) into the principle of least effort, can serve as the basis for organizing needed readability research.

However, to set research priorities, Spencer's dilemma requires refinement. This can be provided by the consideration of factors related to progress in text presentation which have occurred since Spencer's day. Utilizing Spencer's dilemma and giving priority to major developments in the presentation of text, the following research priorities are proposed.

1) Cognitive-Affective

The original dilemma in which cognitive processing is facilitated by simple efficient prose while affect is facilitated by stylistic variety has not been adequately investigated. Flesch's (1948) Human Interest formula represents a single, preliminary attempt to predict affect of text. The development of a formula to predict affect should recieve high priority as should investigations to determine the relationships of cognitive and affective variables in readability formulas. The data base of the authors provides a source for investigating the cognitive and affective aspects of this problem, and they plan to present a new Human Interest formula and a new easy to use reading difficulty formula in the near future.

2) Orthographics-Phonics

The relationship of orthographics to readability has not been adequately investigated. Lewrenz's consideration of difficult words as those beginning with "i" and "e" and of easy words as those beginning with "w", "h" and "b" represented an intuitive acknowledgement of this problem area. By the utilization of rather complex computer programming, Jacobson (1974) and Harris-Jacobson (1976) were able to extend readability variables to include letter-sound (phoneme-grapheme) correspondences and substantially increase their prediction of tested pupil comprehension of McCall-Crabbs passages. Research is needed in which a refinement of the

phoneme-grapheme correspondence variables in readability formulas may be better understood because of their relationship to instruction in reading and to the development of phonics skills in most basal readers.

3) Graphics Design

The recent and radical development of graphics design make it a priority area for investigation. The contribution of graphics to the comprehensibility of the cognitive and affective components of a message has received little attention and needs a great deal of study. In addition, the interaction of the graphics design with the textual material also needs investigation. The graphic variables might include pictorial data, tabular data, symbolic data and format design. It is possible that pattern-recognition or computer-aided-design technology will facilitate such investigations.

4) Readability and Developmental Reading

Investigations need to be conducted in which readability formulas are related to factors in developmental reading. Basal readers include a careful instructional plan for the scope and sequence of skills that facilitate reading development. Many of the variables in developmental reading are also included in readability formulas, but the relationship of these readability variables to developmental instructional variables has not been determined.

For beginning readers, reading instruction usually emphasizes vocabulary development. From the standpoint of efficiency and of readability, vocabulary development should utilize high frequency words and familiar words. In developmental reading it is also desirable to control the introduction of new or unknown words in the progression of stories in the readers so as not to overload the limited channel capacity of the reader. How such vocabulary can be controlled and yet permit variety which achieves interest and delight is a difficult problem. Vocabulary development cannot be treated in isolation but needs to be considered along with the roles of decoding skill development, syntactic pattern development, and the type of inferencing required.

It is likely that the history of development of all four of these variables (decoding skills, vocabulary, syntactic patterns, and inferences) needs to be mapped throughout entire reading series. This is a very large job because difficulties with the relation of prior knowledge to new knowledge plague studies of reading series based on small samples of large texts. Sampling of stories at selected levels of difficulty could avoid this problem of controlling prior-new knowledge if one were only interested in vocabulary and if the vocabulary carried the entire message. Controlling the ratio of prior to new knowledge in vocabulary can be approximated since the number of high frequency and familiar words can be determined by the use of existing word lists such as those of Harris-Jacobson (1972), American Heritage (1971), and Taylor, Frackenpohl, et al (1969), which are based on school

texts. However, comparable lists which show the developmental sequence of high frequency phonics skills, syntactic patterns, and inferencing skills which are common to major reading series are not available. The development of such skill lists would facilitate the control of prior-new knowledge with respect to these variables as word lists do for vocabulary. Recent efforts to measure the effects of regularity of phoneme-grapheme correspondence on readability (Jacobson, 1974 and Harris-Jacobson, 1976) provide preliminary work which can be built upon. These phoneme-grapheme correspondences in readability formulas can be related to a recent compilation of the most common phonics skills in the primary levels of six widely used reading series (Jacobson, 1978).

Work by Selden (1977), which provided preliminary measures for determining frequency of syntactic patterns and their relationship to readability, can be refined and utilized to develop lists of high frequency syntactic patterns in basal readers. Selden assigned a most common grammatical function to every word in the Harris-Jacobson Core Vocabulary. He then developed a computerized method for recording sentences as grammatical strings. For example, "The cow jumped over the moon" would be recorded as: article, noun, verb, preposition, article, noun. He then took reader selections from second to twelfth grade and identified all the grammatical strings in these selections. Using the relative frequency of the strings in books for low and high grades, he predicted the readability of the samples. He found correlations that were statistically significant but too low to be

practically useful. He recommended that grammatical strings should be combined into groups of corresponding difficulty to improve measurement of readability.

Work by Frederiksen could provide a basis for determining the high frequency inference patterns utilized in beginning reading. Frederiksen (1977) has provided a tool that may lead to insights into causes for the differences between text and that which is recalled after reading the text. He has developed a taxonomy of inference types. These are the operations and functions that cause readers to alter text. The operations involve alterations in concepts, propositions and related propositions. The functions include resolution of ambiguity, of topic, of reference, etc. By analyzing both the operations and the rationale for these, insights into the probable thought processes of the reader can result. Frederiksen (1978) looked at the processing requirements of basal readers and compared the inferencing difficulties with difficulties rated by readability formula and found results of considerable interest.

We believe that readability formulas which account for such variables would not only point to effective ways to design document improvement strategies but would also contribute to the explanation of why such strategies are more effective than others.

The results of such work should further explicate Spencer's principle of least effort so that it would now represent economy of words (including abstract words), sentences, of prior vs. new knowledge, orthographics, and

graphic design; while providing specific recommendations for stylistic variation of textual and graphic variables to increase the interest and delight of the reader.

Activities for the Near Future

While there is need for much basic research on the readability problems and possibilities just discussed, the practical need for a readability formula that is easy to apply and more accurate than the formulas currently in popular use challenges us to try to provide a more useful one.

As mentioned near the beginning of this paper, our first step toward a new readability formula is the completion of the revised H-J Reading Vocabulary for the Primary Grades. The second step will be to combine the various McCall-Crabbs exercises given at different grade levels in the Virginia survey into a single scale of ascending difficulty. This should provide a more valid criterion than the published norms for the McCall-Crabbs exercises, which are now quite old. We hope to find a formula that will measure with satisfactory accuracy from grade 2 through grade 12.

REFERENCES

Bormuth, John R. "Readability: A New Approach," Reading Research Quarterly 1, Spring, 1966.

Bormuth, John R. "Empirical Determination of the Instructional Reading Level," Reading and Realism, ed. by J. Allen Figurel. Conference Proceedings, Vol. 13, Part 1. Newark, Del.: International Reading Association, 1969.

Bormuth, John R. (Ed.), Readability in 1968. Research Bulletin of the National Conference on Research in English. Champaign: National Council of Teachers of English, 1968.

Carroll, J.B., Davies, P., and Richman, B. The American Heritage Word Frequency Book. Boston: Houghton Mifflin Co., 1971.

Carlyle, Thomas. On Heroes, Hero-Worship and the Heroic in History. (In 1841, James Fraser in London and D. Appleton in New York brought out this book, the title page reading: "On Heroes, Hero-Worship and the Heroic in History," six lectures). This was subsequently republished in many forms including the recent copy by the University of Nebraska Press, Lincoln, Nebraska, 1966.

Chall, Jeanne. "Readability: An Appraisal of Research and Application." Bureau of Educational Research Monographs, No. 6. Columbus, Ohio: Ohio State University, Bureau of Educational Research, 1958.

Chomsky, Noam. Syntactic Structures. The Hague: Mouton, 1957.

Coleman, E.B. "Experimental Studies of Readability, Part I: Stimulus Dimensions that Affect Readability," Elementary English, March 1968, 45, 316-323, 333.

Dale, Edgar. "A Comparison of Two Word Lists," Educational Research Bulletin (Ohio State University) 18, December 8, 1931.

Dale, Edgar, and Chall, Jeanne S. "A Formula for Predicting Readability," Educational Research Bulletin, (Ohio State University, 27, Jan. and Feb., 1948.

Dale, E., and Tyler, R.W. A study of the factors influencing the difficulty of reading materials for adults of limited reading ability. Library Quarterly, 4, 1934.

Felsenthal, Norman, Shamo, G. Wayne, and Bittner, John R. "A Comparison of Award-Winning Radio Commercials with their Day-to-day Counterparts," Journal of Broadcasting, XV (Summer, 1971), 309-315.

Fillmore, Charles. The Case for Case. in Bach, E. and Harms, R. (eds.) Universals in Linguistic Theory. New York: Holt, Rinehart and Winston, 1968.

Flesch, R. "A New Readability Yardstick," Journal of Applied Psychology, 1948, 32, 221-233.

Flesch, R. "How to test readability: measuring the level of abstraction," Journal of Applied Psychology, 1950, 32, 334-390.

Flesch, R. Marks of Readable Style. New York: Bureau of Publications. Teachers College, Columbia University, 1943.

Frederiksen, Carl H. Inference and the structure of childrens discourse. Paper presented at Society for Research in Child Development, 1977.

Frederiksen, Carl H. Inferential processing required by basal readers. Paper presented at the American Educational Research Association meeting, 1978.

Frederiksen, Carl H. Semantic Processing Units in Understanding Text. In Roy Freedle (Ed.) Discourse Production and Comprehension. Hillsdale, N.J.: L. E. Erlbaum, Assoc., 1978.

Gray, William S., and Leary, Bernice E. What Makes a Book Readable. Chicago: University of Chicago Press, 1935.

Gunning, Robert. The Technique of Clear Writing. New York: McGraw-Hill, 1952.

Gunning, Robert. The Technique of Clear Writing. New York: McGraw-Hill, 1968.

Harris, Albert J., and Jacobson, Milton D. Basic Elementary Reading Vocabularies. New York: Macmillan, 1972.

Harris, Albert J., and Jacobson, Milton D. "Revised Harris-Jacobson Readability Formulas." College Reading Association, Bethesda, Maryland, October, 1974.

Harris, Albert J., and Jacobson, Milton D. "The Harris-Jacobson Readability Formulas," in Appendix D of How to Increase Reading Ability, 6th ed., by A. Harris and E. Sipay, New York, N.Y. David McKay Co., Inc., 1975.

Harris, Albert J., and Jacobson, Milton D. "Predicting Twelfth Graders' Comprehension Scores." Journal of Reading, Vol. 20, No. 1, October, 1976, pp. 43-46.

Harris, Albert J., and Jacobson, Milton D. "The Harris-Jacobson Primary Readability Formulas," Paper presented at the Annual International Reading Association meeting, Denver, Colo., 1973

Hirsch, E. D. The Philosophy of Composition. Chicago: The University of Chicago Press, 1977.

Jacobson, Milton D. "Predicting Reading Difficulty from Spelling." Spelling Progress Bulletin, Spring, 1974, 8-10.

Jacobson, Milton D. "Reading levels of the Experimental Editions of the BSCS Elementary School Sciences Program." BSCS Newsletter No. 31, p. 8-9, 1976.

Jacobson, Milton D. "Reading Difficulty of Physics and Chemistry Textbooks," Journal of Educational and Psychological Measurement 25, (Summer, 1965), pp. 449-457.

Jacobson, Milton D. "The sequences of the highest frequency decoding skills and comprehension skills in the most widely used basal readers." Annual I.R.A. Convention, 1978.

Jacobson, M. D. and MacDougall, M. A. "Automated Analysis of Computerized Instructional Systems." Proceedings of the 6th Annual National Colloquium for Information Retrieval, October, 1969, p. 281-292.

Jespersen, O. Progress in Language with Special Reference to English, London, 1894.

Lorge, Irving. "Predicting Readability." Teachers College Record 45, March, 1944.

Martinet, A. A Functional View of Language, Oxford, 1962.

MacDougall, Mary Ann. Methods of Presenting Programmed Science Materials to Fourth Grade Pupils of Varying Ability and Achievement. Final Report, Project No. 6-1310, U.S. Department of Health, Education and Welfare, Office of Education, Bureau of Research, June, 1970.

Nelson, Joan. "Readability: Some Cautions for the Content Area Teacher," Journal of Reading, Vol. 21, No. 7, April, 1978, p. 620-625.

McCall, William A. and Crabbs, Lelah M. "Standard Test Lessons in Reading, Book A, B, C, D and E," Teachers College Press, Columbia University, New York, N.Y. 1961.

Ojemann, R. The readability of parents and factors associated with the difficulty of parent education materials. In G. D. Stoddard (ed.), Researchers in Parent Education II. Iowa City, Iowa: University of Iowa, 1934.

Selden, Ramsay W. Development of a Frequency-Based Measure of Syntactic Difficulty for Estimating Readability. Doctoral Dissertation, University of Virginia, 1977.

Spache, George. A new readability formula for primary grade reading materials. Elementary School Journal, 1953, 53.

Spache, George. Diagnosing and Correcting Reading Disabilities. Boston: Allyn and Bacon, 1974.

Spencer, Herbert. Philosophy of Style. New York: D. Appleton and Co., 1881 (reprinted from 1852).

Standahl, Timothy C. "Readability Formulas: What's Out, What's In?" The Reading Teacher, vol. 31, No. 6, March, 1978, p. 642-646.

Taylor, Stanford E., Frackenpohl, Helen, and White, Catherine E. A Revised Core Vocabulary: A Basic Vocabulary for Grades 1-8; An Advanced Vocabulary for Grades 9-13. Research and Information Bulletin No. 5 (revised). Huntington, N.Y.: Educational Development Laboratories, March, 1969.

Thorndike, Edward L. The Teachers Word Book. New York: Bureau of Publications, Teachers College, Columbia University, 1921.

Thorndike, Edward L. A Teacher's Word Book of 20,000 Words. New York: Bureau of Publications, Teachers College, Columbia University, 1931.

Thorndike, E. and Lorge, I. The Teacher's Word Book of 30,000 Words. New York: Teachers College Press, 1944.

Venezky, R. L. The Structure of English Orthography, The Hague, 1970.

Vogel, Mabel, and Washburne, Carleton W. "An Objective Method of Determining Grade Placement of Children's Reading Material." Elementary School Journal 28, Jan., 1928.

Washburne, Carleton W., and Morphett, Mabel V. "Grade Placement of Children's Books." Elementary School Journal 38, Jan., 1938.

Yoakam, Gerald A. Basal Reading Instruction. New York: McGraw-Hill Book Co., 1955.

Zipf, G. K. Human Behavior and the Principle of Least Effort, Cambridge, Mass., 1949.